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Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET

May 1982 No. 165

R. WESLEY MILLER *EDITOR*

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FOREWORD

Enclosed with this Report is a copy of a speech presented by George White, Jr., at the AIF Fuel Meeting on March 22, 1982 in New York City.

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of April 30, 1982 is $20.75 per pound U_3O_8, down $1.75 from last month's level of $22.50.

This downward adjustment reflects the deteriorating condition of the spot and near-term markets. Trends evident last month accelerated. The ratio of near-term supply to near-term demand widened sharply from 5.2:1 last month to 9.3:1 this month. Not only did supply increase, but demand was reduced as one large order was filled. Also evident was an increased willingness of sellers (both utilities and producers) to cut prices to compete for available business.

It seems likely that prices will remain under pressure so long as available supply in the near term continues to overwhelm near-term demand. The continuing deterioration of the spot and near-term markets is increasing the divergence between spot prices and prices more typically discussed under longer-term contracts. This situation must, in time, lead to additional producers buying or early procurement by utilities seeking to fill longer-term needs.

The **Transaction Value** as of April 30, 1982 is $22.60 per pound U_3O_8, down $0.80 from March. April's Transaction Value includes 13 transactions totaling 3.6 million pounds U_3O_8 and covers a period of 3 months.

Three uranium sales are reported this month:

1. A Far East user purchased from an unidentified party less than 50,000 pounds U_3O_8 for delivery in 1983 in the form of UF_6.

2. A US producer purchased 601,000 to 1,000,000 pounds U_3O_8 for immediate delivery. The ultimate seller was a US utility.

3. A US producer purchased 101,000 to 300,000 pounds U_3O_8 for immediate delivery. The seller was another US producer.

The **Conversion Value** as of April 30, 1982 is $1.20 per pound U as UF_6, unchanged from last month. The conversion market remains quiet.

The **Loan Use Charge Rate** remained at six percent.

AFRICA

In another unusual break with tradition, officials of Western Areas Gold Mining Company announced in late March, at the official opening of their new uranium plant, that a West German power company, Nordwest Deutsche Kraftwerk (NWK), had purchased a substantial portion of the mine's uranium output under a long-term contract. The contract, concluded through Nufcor in early 1980, provided for an interest free loan of 30 million Rand to assist in financing the plant.

Output is estimated at about 1,250,000 pounds U_3O_8 annually. Although specific contract details are not available, comparable contracts written by other South African producers have provided for the delivery of up to 80 percent of output to major customers. Deliveries to NWK will not begin until 1983; 1982 production will be stockpiled or sold in the spot market as opportunities arise.

Western Areas is administered by Johannesburg Consolidated Investment Group which also administers Randfontein Estates.

Last month, Nuexco reported that Japanese utilities (since learned to include Kansai and perhaps Shikoku and Kyushu) had contracted for a major portion of Beisa's production. The current announcement would seem to confirm earlier speculation that the unprecedented publicity given to the identities of South Africa's uranium customers is designed to reassure existing and potential customers of South Africa's reliability and commitment to long-term uranium supply.

AUSTRALIA

Energy Resources of Australia (ERA)'s Ranger uranium mine produced approximately 1.7 million pounds U_3O_8 during the first quarter of 1982, a rate of about 95 percent of its nominal capacity. The current production rate is slightly above nominal capacity and it is quite likely that ERA will reach its 1982 target of seven million pounds U_3O_8. Ranger output during the period mid-August 1981 to the end of March 1982 was approximately 4.3 million pounds U_3O_8.

Jabiluka's developer, Pancontinental Mining Ltd., is experiencing delays in the ratification of its agreement with the Northern Land Council (NLC) by the aboriginal landowners. The NLC negotiated with Pancon and Getty Oil Co., the joint venture partners, and initialed the agreement on behalf of the local landowners on February 27, 1982. Before the agreement can go into effect, it must be ratified by the landowners. That had been expected to be fairly automatic, but the landowners now say they need more time to consider details of the agreement.

A policy shift by the Australian Workers Union (AWU) in South Australia may be bolstering the prospects of the Roxby Downs project. Until recently,

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the state's opposition party had maintained a solid anti-uranium stance, but the state AWU decision to support uranium development appears as a first crack in the unity of local opposition to uranium mining in South Australia. The policy reversal brings the state AWU in line with national AWU policy and provides union support for workers employed on the large copper, gold and uranium deposit at Roxby Downs. The South Australian Parliament is considering an indenture bill authorizing the mining of the Roxby Downs deposit. The project, owned by Western Mining Corp. (51%) and British Petroleum Australia Ltd. (49%), has estimated ore reserves of 250,000 tonnes U_3O_8.

The South Australian Uranium Corp., a joint venture owned by Oilmin N.L. (16.6%), Petromin N.L. (16.6%), Transoil N.L. (16.6%) and Western Nuclear Ltd. (50%), will be filing its environmental impact statement in May for the development of the Beverly deposit. The statement proposes to mine reserves of 15-16,000 tonnes U_3O_8 by in situ leaching methods.

Urangesellschaft Australia Pty., Ltd. (UGA), operator of the Westmoreland joint venture in northern Queensland, began a substantial drilling program on the property in April designed to discover higher grade uranium reserves. The project is owned by Queensland Mines Ltd. (40%), CSR (12.75%), UGA (37.5%) and I.O.L. Petroleum (9.75%). Based on geological evidence, the partners believe there is a high probability of discovering better grades. Results are expected in October at the end of this field season.

A year ago, reserves at Westmoreland were reported as follows (millions of pounds U_3O_8):

Proven	1.9
Probable	13.6
Possible	7.9

The average grade was reported to be 0.17% U_3O_8.

CSR recently offered its equity in Westmoreland for sale.

CANADA

In a surprise move, Eldorado Nuclear announced on April 28, 1982 that they had executed a memorandum of principal terms under which Eldorado will purchase from Gulf Oil all of the outstanding shares of Gulf Minerals Canada Limited in return for uranium concentrates from Eldorado's inventory.

In practical terms, this means that Gulf has traded its interest in the Rabit Lake mine and mill, the Collins Bay and Eagle Point orebodies, and assorted other uranium properties in return for most of the Canadian stockpile. Discussions have been in progress for about a year.

From Gulf's viewpoint, the move allows them to import now the Canadian material that is needed for the Westinghouse settlements and probably skirts the upgrading issue that had been impeding Gulf's efforts to import U_3O_8 rather than UF_6.

For Eldorado, of course, the purchase provides a solid new base of production now that Beaver Lodge is scheduled for shutdown this summer. It is believed that Eldorado will also inherit those contracts with non-US customers that were scheduled to be supplied from Gulf's share of Rabit Lake.

To the extent that the Canadian stockpile is fed by Gulf into the hands of consumers, inventories in the US will be increased. Although it is not known whether the stockpile transfer will be immediate or over several years, something like ten or twelve million pounds will move from a government stockpile to user stockpiles where much of it will be considered excess.

FAR EAST

New data on Japan's nuclear plans became available this month, updating and expanding the information provided last month in Report 164. At the request of the Agency for Natural Resources and Energy (ANRE), the nine electric utilities and JAPC submitted their proposed nuclear plant construction plans. ANRE (a part of MITI) will review these proposals to develop a long range energy policy.

The utility response calls for 54 reactors providing a nuclear generating capacity of 46,619 MWe to be in operation by March 31, 1991. The breakdown is presented in Table 2.

Table 2

SUMMARY: JAPAN UTILITIES' NUCLEAR POWER PLANS

Category	Reactors[1]	Gross MWe[1]
In operation	23	16,077
Under construction	10	9,544
Planned (authorized)	8	7,263
Planned (not authorized)	13	13,735
	54	46,619

[1]PNC's operating Fugen ATR (165 MWe) and authorized Monju FBR (280) MWe) are excluded from this compilation.

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As ANRE studies the plan summarized in Table 2, it will likely realize that the utility plans are too ambitious in the later years. Table 3 presents a breakdown of the planned utility construction status.

Table 3

PLANNED UTILITY CONSTRUCTION SCHEDULES

Year of Planned Operation	Under Construction	Planned (Authorized)	Planned (Not Authorized)	Total
1982	1	—	—	1
1983	—	—	—	0
1984	3	—	—	3
1985	4	—	—	4
1986	2	1	—	3
1987	—	1	—	1
1988	—	2	—	2
1989	—	2	1	3
1990	—	2	9	11
first qtr. 1991	—	—	3	3
Total	10	8	13	31

Counting the two units (Genkai-2 and Ikata-2) already placed in service in 1982, a total of 19 units are scheduled for operation in the eight year period 1982-1989. That amounts to an average of 2.4 units and about 2,200 MWe per year. By contrast, 14 units representing more than 14,000 MWe are scheduled for 1990 and early 1991. Such an accomplishment seems unlikely. A more realistic scenario would be a continuation of the historical trend. This would result in some 44 or 45 units (as opposed to 54) and some 36,000 to 37,000 MWe (as opposed to 46,600 MWe) in service by March 31, 1991.

Last month, Report 164 projected Japan's annual rate of uranium consumption by 1990 at about 14 million pounds U_3O_8. Based on the revised utility plans, forecasts of Japan's 1990 rate of uranium consumption should be reduced to approximately ten million pounds U_3O_8 per year.

UNITED STATES

April was an active month for US producers. Plateau Resources Ltd., a wholly owned subsidiary of Consumers Power, began operations at its Shootaring Canyon, Utah mill on April 13, 1982. The initial milling rate is expected to be 580 tons per day, with mining continuing at a rate of 600 tons per day. Beginning head grade will be about 0.10 percent.

Dawn Mining restarted operations at its Washington state Midnite mine which had been shut down for the winter. Mill operations had continued throughout that time, running on stockpiled ore.

Exxon shipped the last ore from its Felder mine in Texas to the Conquista mill where it has a tolling arrangement with Conoco and Pioneer. The Felder mine is considered mined out and now is closed permanently.

Union Carbide Corporation repeated its 1981 strategy and suspended operations at its Uravan, Colorado mill for 5 months beginning in mid-April. Union Carbide has determined that, given conditions unique to the Uravan mill, it is more economical to operate at full capacity for half the year than 50 percent capacity year round to meet its supply commitments. Plans call for the mill to resume production by October, 1982.

Cogema's purchase of General Electric's subsidiary, Pathfinder Mining Company, was completed March 26, 1982 with the transfer of 80 percent of Pathfinder's stock to the French company. GE reported that the sale was at

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"approximately book value." It is expected that Pathfinder will retain its current management and name. It is also expected that Cogema's US uranium subsidiary, Framco, will be absorbed by Pathfinder or dissolved, centralizing all of Cogema's US operations under a single organization.

The Washington Public Power Supply System (WPPSS), under pressure from the Bonneville Power Administration (BPA), suspended construction on WPPSS Unit 1 (61 percent complete and previously scheduled for commercial operations in 1986).

Recently, BPA released its electrical usage forecast for the Pacific Northwest, concluding that the area will eventually need the 3 nuclear power units its partner, WPPSS, has under construction. However, given the units' current construction schedule, there would be excess capacity for some time. Therefore, the BPA recommended that WPPSS suspend construction on WNP 1 while completing WNP 2 and 3 as quickly as possible.

The suspension is scheduled to last two to five years, but if the present political and economic conditions persist, WPPSS will encounter formidable obstacles to the resumption of construction. The demise of WNP 1 means that only two of the five WPPSS nuclear power plants are still under construction.

Portland General Electric withdrew its site license application for its planned nuclear power units Pebble Springs 1 and 2, effectively cancelling those units. These units were not included in Nuexco's uranium consumption forecast published in Report 164.

Six months ago, in October 1981, USNRC chairman Palladino stated he thought up to 20 nuclear power plants could be licensed in 1982.

The NRC staff recently reported to the commissioners that there may be only 5 nuclear power units licensed in 1982, with a maximum of 20 over the next two years. The difference comes from delays in completion dates by the utilities as well as regulatory problems, as happened with Pacific Gas & Electric's Diablo Canyon 1 unit.

The plants Nuexco believes have a realistic chance of being licensed this year are as follows:

Reactor	Utility	Scheduled Operating Date
San Onofre 2	So. Calif. Edison	June 1982
LaSalle 1	Commonwealth Edison	June 1982
Summer	So. Carolina E&G	August 1982
Grand Gulf 1	Mississippi P&L	December 1982

*Published in the Nuclear News World List of Nuclear Power Plants as of December 31, 1982.

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Sale:			
ACTIVE			
1575		500 per year	Long Term
1584	500		
1637	300		
1739	1,600		
1769A	130		UF_6
1818		250 per year	Long Term
1872	1,100	400	
1877	50		
1895	1,800		some UF_6
1900	2,000		
1906	290		
1909	2,200		UF_6
1916	2,000		UF_6
1925	500		UF_6
1930	500		
TOTAL:	12,970		
INACTIVE			
1581B		150 per year	Long Term
1610	200		
1664	100		
1774	50		
1804	615		
1805		500	Long Term
1810	750		
1812A	500		
1814	250		
TOTAL:	2,365		

[1]Measured from the date of this Report

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URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
ACTIVE			
1742	500		
1785	1,000		
1815	1,000		
1884	275		
1910	1,000		
1919	2,000		
1931	600		
TOTAL:	6,375		
INACTIVE			
1695	225	325 per year	Long Term, as UF_6
1927	1,700		
TOTAL:	1,925		
Inquiries to Borrow:			
ACTIVE			
1780	260		
1812	500		
TOTAL:	760		
INACTIVE			
1621	300		
TOTAL:	300		

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URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Inquiries to Purchase:			
ACTIVE			
1410		1,500 per year	5 M lbs. Total
1699	500		
1744	160		
1842		500 per year	2 M lbs., start 85
1868		300 per year	Long Term
1871	250	250 per year	1983-86
1915		500	UF6
1917	150		
1923	30		
1924	300		
TOTAL:	1,390		
INACTIVE			
1459		200 per year	Long Term
1634	400		
1841	100		
1888		500 per year	Long Term
1889		500 per year	Long Term
1914	200		
TOTAL:	700		

[1]Measured from the date of this Report

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CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF6) 0 to 1 Year	Beyond 1 Year	Remarks
ACTIVE			
1584	350	300 per year	Long Term
1607	1,000		
1609	500	1,500 per year	Long Term
1840	300		
1886	500		
1921	1,700		
1925	450		
TOTAL:	4,800		
INACTIVE			
1451	75		
1619		300	
1661	200		
1764	100		
1902		350	
TOTAL	375		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF6) 0 to 1 Year	Beyond 1 Year	Remarks
ACTIVE			
1622	700	900	
1896	100		
TOTAL:	800		
INACTIVE			
1594	400	450 per year	Long Term
TOTAL:	400		

[1]Measured from the date of this Report.

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CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller Group	Buyer Group	Remarks
1776	83	less than 50	108 .	non-US	unknown	UF_6
1777	Immediate	601-1000	98	US	US	
1784	Immediate	101-300	98	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller Group	Buyer Group	Remarks

There are no conversion transactions reported this month.

[1]Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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MARKET ANALYSIS

REPUBLIC OF SOUTH AFRICA

First quarter 1982 production figures from South African gold-uranium operations are presented in Table 1.

Table 1

REPUBLIC OF SOUTH AFRICA:
Production from Gold-Uranium Operations;
First Quarter 1982

Operation	Thousands of Pounds U_3O_8
Blyvooruitzicht	164
Buffelsfontein	320
CHEMWES	336
Dreifontein Consolidated	129
ERGO	149
Harmony	316
Hartebeestfontein	239
J.M.S.	591
Randfontein	245
Vaal Reefs	756
Western Areas	58
Western Deep Levels	101
TOTAL	3,404

First quarter 1982 output was approximately four percent less than that of the fourth quarter 1981.

The scheduled production buildup of the Beisa section of St. Helena was hampered by continued underground intersections of large quantities of water. No production figures were released for the quarter.

Palabora does not release quarterly production figures, only sales. Sales for the quarter increased from 14,378 kgs to 157,572 kgs U_3O_8 concentrates, reflecting the delivery of material to a new customer during the quarter.

Some observations about some individual uranium operations during calendar year 1981 and the first quarter of 1982 appear in the following paragraphs.

Chemwes (Gencor)

During the first quarter of 1982, the average grade of slimes declined 10.5 percent. The higher grade Buffelsfontein slime Chemwes was treating has been virtually depleted as planned.

Randfontein (JCI)

1. During the first quarter of this year, production was adversely affected (down 12 percent) by the cessation of operations at the Millsite plant and by plant operating difficulties, since overcome.

2. During 1981 Randfontein treated 3.35 million tons for uranium. The yield of 0.177 kg per ton produced 592 tons U_3O_8, 8.5 percent less than 1980's 646 tons.

3. Randfontein has largely attained its objectives of full utilization of metallurgical facilities and optimum recovery efficiencies for both gold and uranium. The aim to produce all contractual requirements for the delivery of U_3O_8 from the Cooke section should be achieved when Cooke No. 3 shaft is brought into full production.

4. Extraction efficiency of the uranium section of the Cooke plant improved by 24 percent. A solvent extraction plant is being constructed to replace the existing ion-exchange section and further improve recoveries. The uranium section of the Millsite plant has been shut down and equipment is being maintained in working order.

5. Working profit from sales of uranium dropped to R12.034 million from R22.532 million. This resulted from lower production as well as lower profitability due to increased treatment costs. Moreover, profits from sale of U_3O_8 bought from other producers to meet contractual commitments is credited to sundry revenue and not included above.

Vaal Reefs (Anglo American)

1. During the first quarter of 1982, production declined 12 percent due to problems which had beset the South Uranium plant for the past several years. Those problems are being overcome by the replacement of the fiberglass absorption columns with stainless steel columns. Full production is expected to be restored momentarily.

2. 8.5 million tons were treated for uranium during 1981. At a yield of 0.20 kg per ton, they produced 1,694 tons U_3O_8 (64 tons less than 1980).

3. Operations of the pressure leach pilot plant sited at the East Gold Plant were suspended in June 1981 in order to redesign the heat recovery system and install the necessary modified equipment. Testwork is expected to resume this year.

4. Major items for the pressure leach plant at the South Uranium plant are being dispatched to the site by suppliers, and the civil work on the project has been completed. Further construction and expenditure were

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temporarily suspended in mid-year until further technical test work has been completed. Construction probably will be resumed before the end of this year.

5. Commissioning of the 200 tons per day oxygen plant sited at the South Division commenced in February 1982.

6. The uranium and pressure leach plants in the South Lease area were financed in part by a consumer loan obtained by Vaal Reefs in conjunction with a uranium sale. The consumer loan was fully utilized during 1981. During the year, the contract was renegotiated to reduce the annual rate of delivery of uranium oxide and to extend the overall delivery period and, further, to extend the repayment period for the consumer loan beyond December 31, 1983 to June 30, 1985. However, the overall amount of uranium oxide to be delivered under the contract is unchanged.

7. Afrikander Lease Section — During 1981 it was decided, in the light of the continued weakness in the uranium market, to suspend stoping operations once sufficient ore had been stockpiled for the uranium plant to be commissioned, but to continue with shaft sinking and limited prospect development. This will provide access to the higher grade section of the orebody and enable the mine to be brought into production at relatively short notice should the uranium market show signs of improvement. As a result, only 6.4 tons of uranium and 5.3 kilograms of gold were produced during the year.

Commissioning of the uranium section is due to commence in the third quarter 1982 whereafter, depending on the state of the uranium market, a decision will be made on the future operation of the uranium section. In the event that Afrikander lease ore is not mined, ore from the West Division will continue to be treated through the gold plant.

8. Planned production for 1982:

Total	Gold	Uranium
Tons milled, treated	8,900,000	8,400,000
Grade	8.2 g per ton	0.2 kg per ton
Production	73,000 kg	1,650 tons

Included in the above are 2,850,000 tons to be milled in the South Lease area at a recovery grade of 11.0 grams per ton, resulting in gold production of 31,350 kilograms and uranium production from the South Lease area of 750 tons.

During 1982 no production of uranium is planned from the Afrikander Lease area, other than the small amount which will be produced during the commissioning of the plant.

9. Present indications are that the company will not be able to sell its entire uncommitted uranium production in 1982. In his annual report to shareholders Mr. D.A. Etheredge (Chairman of Vaal Reefs and the gold and uranium division of Anglo American) made the following comments on the uranium market:

"Although the uranium market continued to weaken during the past year, the dramatic slide in spot market prices seen during 1980 slowed considerably and there are indications that prices are close to bottoming out if they have not already done so. The major part of your company's uranium production is sold under long-term dollar contracts and, despite further weakening of contractual prices under the influence of the spot market, the decline of the Rand relative to the US dollar has partially protected the uranium income. The factors affecting the supply and demand and depressing the spot price have not changed over the past year, and I am not optimistic that there will be any firming of the spot price or demand in the year ahead."

Western Areas (J.C.I.)

1. Production began in the first quarter of 1982. Stoping on the middle Elsburg Reef Horizon has attained planned levels for the current year. The uranium plant is fully commissioned and, although problems are still being encountered with the filtration section, uranium recovery is expected to increase.

2. Contractual deliveries of U_3O_8 will commence in the first quarter of 1983, with a portion of sales revenue in any quarter being utilized to reduce the capital portion of the consumer loan. Any U_3O_8 produced prior to delivery date and any excess production will be sold as opportunities arise. The third and final R10 million installment of the R30 million interest-free consumer loan was received in the first quarter of 1981.

Western Deep Levels (Anglo American)

1. Uranium production for 1981:

	Tons Treated	Recovery Grade kg/t	U_3O_8 Produced kg
No. 1 Plant	291,904	0.183	53,355
No. 2 Plant	2,038,787	0.078	159,129
	2,330,691	0.091	212,484

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Major process changes were made in an attempt to reduce unit uranium production costs. These changes involved the closing down of the No. 1 uranium plant on May 28, 1981 and the curtailment of production from the low-grade tailings dam. An additional radiometric sorting plant capable of significantly upgrading feed material to the new uranium plant has been commissioned. Benefits from these changes should be evident towards the middle of 1982. As a result of sorting the 200,000 tons per month, No. 2 uranium plant is now able to treat the full Carbon Leader Reef production and the head value has been enriched from 0.15 kg per ton to 0.20 kg per ton. The leaching filtration and clarification facilities of the No. 1 uranium plant have been incorporated into the existing gold plant, thus saving R1.8 million on planned capital expenditure.

2. Planned production for 1982:

	Gold	Uranium
Tons milled, treated	3,200,000	1,770,000
Grade	12.19 g/t	0.126 kg/t
Production	39,000 kg	223 tons

TECHNOLOGICAL DEVELOPMENTS IN NUCLEAR FUEL DESIGN AND UTILIZATION

The International Nuclear Fuel Cycle Evaluation (INFCE) studies were initiated in 1978 by President Carter to seek, among other goals, the conservation of uranium resources. This two-year study by international experts established some dozen technical programs to reduce uranium consumption by 20 percent for PWR reactors and 30 percent for BWR reactors over the next decade.

Concurrent to this study, the US DOE initiated a ten-year research, development and irradiation testing program involving all the domestic fuel fabricators and the cooperating utilities to achieve similar results. The DOE program, now in its fourth year, set more aggressive goals of equivalent 25 percent reduction in uranium consumption for PWR reactors and 35 percent reduction for BWR reactors.

Every two years a conference on Nuclear Fuel Performance and Utilization is held under the auspices of the American Nuclear Society to report progress to date. The latest conference, held this April, included major international participation. Many papers were presented by French, German, British, Japanese and Swedish scientists. *The interim results show that the above goals of 25% and 35% reduction, respectively, in uranium consumption will not only be achieved but have good probability of being exceeded.* There was an air of euphoria and optimism at the conference which has been missing from nuclear conferences since 1972.

The results of such programs have been anticipated in Nuexco's uranium consumption forecasts since the time of the INFCE studies. However, we had discounted the stated goals either in magnitude or time of achievement by setting expectations from the program at 12 percent reduction in uranium consumption for PWR reactors and 22 percent for BWR reactors by 1990. In the next published analysis, even though we will continue to discount the rate of industry incorporation of this progress, Nuexco will consider raising our estimates of attainable increases in fuel efficiency.

An advanced fuel design proof-tested by irradiation of several fuel bundles still faces the formidable obstacle of NRC licensing before it can become a standard product. It also takes time to cycle the several reloads into the reactor to achieve a full core of advanced fuel design; it takes further time until that core reaches the extended burnup levels.

The following paragraphs are intended to give the reader a summary of the scope and diversity of the program and the nature of the technical problems to be overcome.

Program Objectives

The original program had the primary goal of uranium conservation; lower fuel cycle costs were a secondary objective. Increased fuel burnup has long been recognized as a possible way of reducing fuel cycle costs, but the current transition to longer refueling cycles has moved the point of lowest fuel cycle cost to considerably higher fuel exposures than before. This, in turn, led to the recognition that driving fuel to much higher burnup levels would achieve a substantial reduction in spent fuel storage requirements. The reduction in spent fuel storage is now becoming an important driving force toward high burnup programs among electric utilities.

Technical Alternatives

Methods for achieving reduced fuel cycle cost and, secondly, lower uranium consumption include:

1. Extension of fuel batch burnup from 30,000 MWD/MTU to 50,000 MWD/MTU for PWR fuel and from 27,800 MWD/MTU to 45,000 MWD/MTU for

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BWR fuel by use of burnable absorbers and control cell core refueling patterns.

2. Inversion or reconstitution of undepleted fuel rods for reinsertion.

3. Use of thorium to develop near-breeder, non-replaceable fuel assemblies in the outer periphery (25 percent) of the core.

4. Shifting of the neutron spectrum during each cycle by flow control and other methods to increase fissile plutonium generation.

5. Use of axial blankets and low-leakage radial blankets to improve neutron economy.

6. Use of burnable absorbers, such as gadolinia, for radial and axial power shaping to achieve uniform fuel burnup.

7. Optimization of refueling patterns to better utilize fissile material.

Without attempting to explain each of the above alternatives, it is important to recognize that there are many choices in achieving the best combinations of variables. Even so, extended burnup has the largest effect.

Technical Problems

The technical problems to overcome are principally these:

1. Internal fuel rod pressure through additional release of fission gases.

2. Fuel pellet swelling and distortion to cause fuel clad rupture.

3. Internal fuel clad chemical attack from fission products such as iodine.

4. External fuel clad corrosion and crud deposition.

5. Fuel rod axial growth and other structural changes.

Technical Solutions

In general, the results to date indicate that the major problems are not a strong function of extended fuel burnup and have proven much less serious than anticipated. Many of the problems can be solved by mechanical design changes and chemical controls, such as:

1. Increased plenum chamber volume in fuel rods to reduce fission gas pressure buildup.

2. Use of 9x9 fuel rod arrays for BWR and 18x18 fuel rod arrays for PWR reactors to reduce heat flux and fuel pellet distortion.

3. Use of a pure zirconium liner inside the Zircalloy fuel clad to eliminate clad rupture from chemical attack.

4. Improved water chemistry to reduce external fuel clad corrosion.

Results to Date

Individual fuel assemblies have now been driven to 43,000 MWD/MTU in BWR plants and 56,000 MWD/MTU in PWR plants without fuel rod failures. Power ramp tests in test reactors of selected high burnup rods have demonstrated reasonable safety margins. Much more testing is in progress. Current work has resulted in the NRC licensing PWR fuel *reloads* for burnups up to 34,000 MWD/MTU, a 13 percent increase over the last several years. Confidence exists that licensing limits can be increased by about 2,000 MWD/MTU per year over the next decade.

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RAW MATERIALS

CLUFF LAKE PROJECT — PART II

Phase 1 Development

The Environmental Assessment & Safety Report submitted to the Saskatchewan Department of Environment by Amok, Ltd. on November 24, 1976, included the proposal to develop the property in two phases. Phase I was to include the mining and processing of the D orebody and the construction of necessary support facilities; Phase II would involve later expansion of facilities to handle larger volumes of ore originating from the Claude, N, and O-P orebodies. Granted approval to proceed with the Phase I/Phase II development concept, Amok initiated the Phase I program in September 1978. Figure 1 shows the location of uranium deposits, the mill site and tailings disposal area.

Amok calculated the uranium reserve in the D orebody at 73,000 tonnes ore containing almost 12,000,000 pounds U_3O_8. Certain sections of the orebody contained uranium values up to 29 percent uranium; however, the calculated average was 7 percent. Due to the high uranium content of the ore, special precautions for the safety of the employees had to be taken during the mining and milling process.

The orebody was mined by open-pit methods. However, because of the special precautions, it took eighteen months to prepare the deposit for mining. Before overburden removal could begin, approximately twenty-five acres surrounding the deposit were fenced off. The fenced area was hand-cleared to preserve the ground cover and prevent erosion. The course of a stream was diverted about 1000 feet away from the pit area.

The next step was to strip the orebody of about twenty feet of overburden consisting mostly of loose sand and gravel. Only a few isolated remnants of bedrock covering the ore had to be drilled and blasted. All waste material was stacked in two piles away from the mine site; it is to be used for back-filling the pit when project reclamation begins.

At the time mining began in June of 1980, the estimated life of the mine was 3.28 years. However, mining progressed rapidly and one-third of the ore was mined by October. As scheduled, the mining operation was stopped for the winter and resumed at an accelerated rate in early spring of 1981.

The D orebody was completely mined out by September 1981, well ahead of the original schedule. Figure 2 is a photograph of the D pit soon after it was mined out.

As ore was removed from the pit, it was graded for uranium content and placed on one of three carefully prepared stockpiles. Ore grading 0.30 percent or less U_3O_8 was deposited on stockpile A; material grading 0.30 to 20.0 percent U_3O_8 went on stockpile B; all ore grading above 20.0 percent went into stockpile C. The ore in stockpile C is held in a concrete structure and covered with one meter of sand to minimize the level of radiation. The sand is carefully removed as ore is required for mill feed.

Mining Procedure

Special precautions developed to protect employees during the mining process are unique to the D orebody. The high-grade portions of unmined ore were covered over by one meter of sand until that portion was scheduled for mining. Then, the ore was continuously mined by rows 2.5 meters in width and height, always moving from north to south. A 2.5 meter cube of ore was mined at a time. The sand shield was removed immediately ahead of the mining face and replaced over the next ore layer after the cube was mined out. All mining equipment and personnel worked off the sand cover above and behind the active ore face, thereby minimizing direct contact with the ore. By carefully synchronizing the mining and shielding procedures, only the ore cube being mined was exposed at any given time.

An operating first for Amok included custom designing most mining equipment to be used on the project. Again, safety precautions were the main consideration and equipment was designed with this in mind. All operator cabs on equipment are environmentally controlled by utilizing special air filtration, temperature control and maintaining air pressure 50 percent above outside air. In addition, all equipment has built-in protection against direct radiation. The ore trucks, for example, have a permanent six centimeter thick steel plate between the cab and the ore hopper to protect the driver at all times from radiation created by each load carried. As added protection, each ore truck was equipped with a mechanically-operated lid to prevent loss of material during transport.

Probably the most unique precaution taken by Amok to prevent the spread of radioactive contamination was the clean-up process for equipment leaving the D mine. A system was developed whereby any piece of equipment moving from the mine to a new location was put through a high pressure cold water jet spray wash before leaving the fenced area. Ore trucks, for instance, were com-

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pletely washed, especially the undercarriage, each load. The wash water is immediately drained to a settling pond for later transfer to a lined water treatment pond already containing a larger water volume pumped directly from the open pit.

The water is treated continuously with lime and sodium sulphate to precipitate uranium, radium and other heavy metals. After a retention time of three to four days, the water enters a second lined pond. Barium chloride is added to remove the last traces of dissolved radium. The water eventually enters a nearby creek and flows into Cluff Lake as clean water.

Milling

The site selected for the processing plant is about four kilometers west of the D pit in an area where the natural drainage pattern is to the northwest away from the site. The tailings pond is located north of the mill on a stream drainage system with sufficient topographic relief to allow construction of a suitable dam and containment area. The pond area is large enough to adequately hold all waste material generated during the life of the project.

The Phase I processing plant was designed to process medium- and high-grade ore from the D orebody. Considering the small tonnage involved, the capacity of the mill is about 80 tonnes ore per day. Average processing rate is currently about 74 tonnes ore per day at an average grade of 6.8 percent U_3O_8.

Ore delivered to the mill is handled according to grade. The high-grade ore goes to the primary crusher where it is reduced to particles of less than 10 centimeters in diameter. It is then transferred to the high-grade storage bins. The medium-grade ore which averages 4.0 percent uranium is crushed separately to particles of less than 1.3 centimeters in diameter. It is put through a gravimetric concentration process to produce a concentrate containing about 45 percent uranium and a tailings containing about 0.30 percent uranium. The concentrate is transferred to storage bins and the tailings, or gravimetric residue, are transferred to a stockpile for Phase II processing. Figure 3 is a photograph of the operating mill. The gravimetric concentrate and high-grade ore are crushed and stored under the two domes. The primary mill circuits are housed in the large building on the left.

The high-grade ore and the concentrate are passed to a common rod mill to further reduce the particle size. The well-blended ores are subjected to an acid leach during which all minerals contained in the ore go into solution. The solution is next subjected to a two-stage precipitation and filtration process to remove nuisance minerals of iron, aluminum, molybdenum and thorium. The uranium stays in solution to be treated with magnesium oxide. The uranium precipitates out as magnesium diuranate (yellowcake). The yellowcake is washed and dried for packaging.

All solid and liquid waste material is neutralized with barium choloride and lime prior to being discharged to the tailings pond. The residue resulting from filtration and washing of the solution containing dissolved uraniun contains 99.9 percent of the radium in the ore. This material is neutralized with lime and stored in buried concrete vaults. The tailings and residue storage sites are continuously monitored for radiation and groundwater contamination.

When the project is terminated, the water will be drained from the tailings pond and the surface sealed with an impervious layer. A suitable layer of soil will be placed over the pond area and revegetated as a final safety precaution against radiation and erosion.

Phase II Development

The Phase II program is presently in the final stage of planning. The program will probably be ready for submittal to the Saskatchewan Department of Environment by October of this year. The program will include the expansion of the existing mill to 1500 or 2000 tonnes ore per day. The mill feed will consist of the gravimetric residue from the D deposit, plus ore to be mined from the other deposits in the area. The average grade of the mill feed will be 0.30 percent U_3O_8.

Preparations to mine the remaining deposits are progressing rapidly. The Claude will be mined by open pit, starting with the experimental pit this summer. Underground evaluation of the O-P deposit has been completed; however, it is likely that the deposit will not be mined at this time because the ore grade is considered to be too low in today's market. Engineering is well advanced for the underground development of the N deposit. Ore extends from a depth of about 30 to 170 meters.

Exploration activity has been continuous through the lease area. The Dominique Peter (D-P) deposit was discovered last year and is now being delineated. It is located about midway between the Claude and O-P deposits and is similar to the Claude deposit in size and grade. It is also likely that the D-P deposit will be mined by underground methods. The Phase II program could extend the life of the project by another six to eight years.

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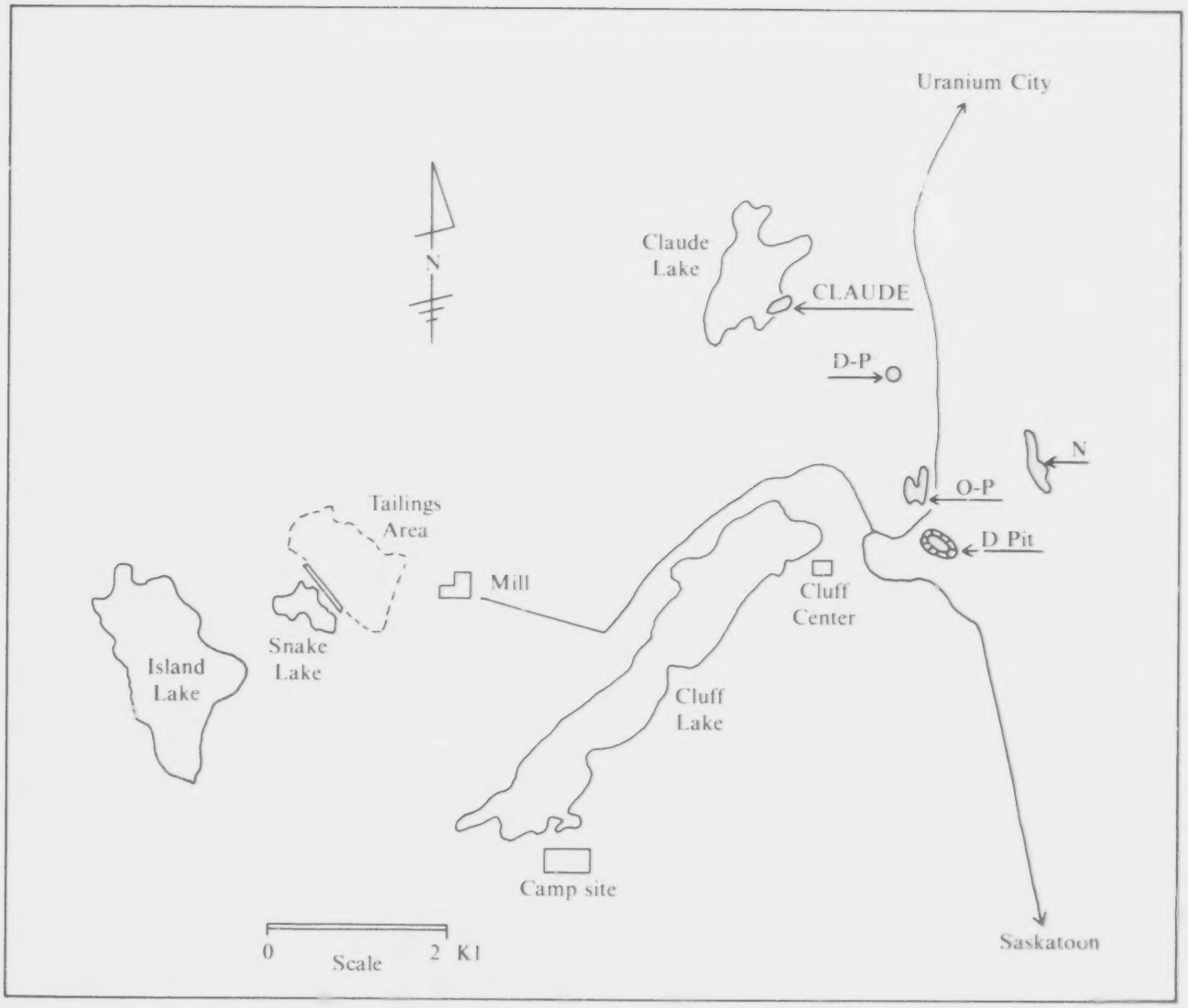

Figure 1

CLUFF LAKE PROJECT — LOCATION MAP OF FIVE URANIUM DEPOSITS, THE MILL SITE AND TAILINGS DISPOSAL AREA

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Figure 2

D PIT AS IT APPEARED IN THE FINAL STAGE OF MINING. APPROX. 107,000 TNS ORE AND 575,000 TNS OVERBURDEN WERE REMOVED FROM THE PIT.

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Figure 3

**CLUFF LAKE MILL ON LEFT,
CRUSHED ORE STORAGE ON RIGHT**

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STATISTICAL DATA

EXCHANGE VALUE $20.75/lb. U_3O_8
Determined as of April 30, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.
B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

[1]In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of April 30, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
22.60	3.6	13	3

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

[2]Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75								

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60								

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	20.75	45.75	53.95
France (franc)	127.07	280.13	330.35
FRG (mark)	48.53	106.98	126.16
Japan (yen)	4,900	10,802	12,738
Switzerland (franc)	40.59	89.49	105.53
UK (pound)	11.56	25.49	30.06
Australia (dollar)	19.55	43.09	50.82
Canada (dollar)	25.39	55.97	66.00
Niger, Gabon (CFA)	6,346	13,990	16,497
South Africa (rand)	21.77	48.00	56.61
Sweden (kroner)	121.06	266.90	314.73

[1]Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.20/lb. U as UF_6
Determined as of April 30, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of April 30, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon.
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

[1]Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00R
Annual Avg. 1981	355.2	236.97R
Nov 1980	350.4	221.50
Dec 1980	351.7	222.41
Jan 1981	357.8	230.58P
Feb 1981	356.6	230.41P
Mar 1981	355.2	229.66P
Apr 1981	354.6	229.38P
May 1981	353.4	237.31P
Jun 1981	360.4	237.62P
Jul 1981	356.9	237.54P
Aug 1981	359.7	237.54P
Sep 1981	357.2	237.51P
Oct 1981	351.4	238.95P
Nov 1981	350.2	240.65P
Dec 1981	348.7P	256.43P
Jan 1982	353.7P	256.20P

P = Preliminary R = Revised since last month

[1]Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.
[2]Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.
[3]Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Dec 1980	258.4	11.13	8.32	8.92
Feb 1981	263.7	11.43	8.59	9.00
Mar 1981	265.5	11.47	8.63	9.17
Apr 1981	267.9	11.73	8.76	9.33
May 1981	270.0	11.99	8.90	9.49
Jun 1981	272.3	12.03	9.16	9.57
Jul 1981	274.3	12.07	9.20	9.62
Aug 1981	276.2R	12.19	9.15	9.63
Sep 1981	276.9R	12.63	9.22	9.77
Oct 1981	279.1R	12.82	9.35	9.91
Nov 1981	278.6R	13.01R	9.45	9.89
Dec 1981	279.8R	12.96P	9.42R	10.06P
Jan 1982	281.4R	13.42P	9.59P	10.15P
Feb 1982	282.8P	—	—	—
Mar 1982	284.0P	—	—	—

P = Preliminary R = Revised since last month

[1]Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2]Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3]Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4]Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3,6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3,6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3,6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Annual Avg. 1981	41.89	203.5	218.3	728,506	2,820,505
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6	724,604	251,502
Oct 1981	—	213.4	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	233.1	—	—
Feb 1982	—	220.2	236.8	—	—
Mar 1982	45.49	225.2	—	—	—

[1]Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.
[2]Republic of South Africa Department of Statistics, Pretoria: "Government Gazette: Consumer Price Index for Urban Areas."
[3]Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.
[4]April 1970 = 100.00.
[5]Bulletin of Statistics, Department of Statistics, Pretoria.
[6]Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index—Industrial Commodities (1967 = 100)[1]	Producer Price Index—All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	304.1	293.4	272.4	193.71	11.57R	11.97	9.12	7.65
May 1981	304.7	294.1	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	305.1	294.5	271.3	191.06	11.31	11.88	9.07	7.60
Jul 1981	306.2	296.0	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.2	296.2	276.5	—	11.85	12.09	9.19	7.76
Sep 1981	307.4	295.7	279.3	195.61	12.11	12.68	9.38	7.79
Oct 1981	309.0	296.1	279.9	—	12.09	12.43	9.37	7.84
Nov 1981	309.3R	295.5	280.7	—	12.14	12.47	9.42	7.86
Dec 1981	310.1P	295.9P	281.5	200.10	12.09	12.44	9.52	7.93
Jan 1982	311.7P	298.2P	282.5	—	12.21R	12.65R	9.68R	8.02R
Feb 1982	311.4P	298.5P	283.4	—	12.29P	12.58P	9.65R	8.00P
Mar 1982	311.0P	297.9P	283.1	201.88	—	—	9.64P	8.05P

P = Preliminary R = Revised since last month

[1]US Bureau of Labor Statistics, Washington, D.C., "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2]US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3]US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4]US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5]Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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FIGURES OF THE MONTH

	This Month	Last Month	12 Months Ago
	(Referenced to April 30, 1982)		
Exchange Value[1]	20.75	22.50	25.00
Transaction Value[1]	22.60	23.40	25.70
Conversion Value[2]	1.20	1.20	1.40
Loan Use Charge Rate[3]	6%	6%	7%
Near-Term Uranium Supply[4]	13.0	11.2	7.1
Near-Term Uranium Demand[5]	1.4	2.2	1.6
Near-Term Supply-Demand Ratio	9.3	5.2	4.4
Optimum Tails Assay[6]	.318	.310	.280
Current Transactions[7]:			
Number of Transactions	3	6	6
Quantity of Material[8]	0.7-1.4	0.6-1.4	7.0-12.0

[1]US $ per pound U_3O_8 equivalent
[2]US $ per pound U as UF_6
[3]Percent per annum
[4]Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[5]Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[6]Percent U_{235}
[7]Uranium transactions only; does not include loans or conversion transactions
[8]Millions of pounds U_3O_8 equivalent

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OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]

[1]Based on Exchange Value and USDOE 1980 AFC SWU price; interpolated to the nearest thousandth.

STANDARD ABBREVIATIONS

ACTU:	Australian Council of Trade Unions
AEB:	Atomic Energy Board (South Africa)
AEC:	Atomic Energy Commission (US) (predecessor of NRC and DOE)
AECB:	Atomic Energy Control Board (Canada)
AFC:	Adjustable fixed commitment (swu contract)
AFR:	Away from reactor
AFUDC:	Allowance for Funds Used During Construction
AGR:	advanced gas-cooled reactor
BLWR:	same as BWR
BNFL:	British Nuclear Fuels, Ltd. (UK)
BWR:	boiling water reactor
CEA:	Commissariat a l'Energie Atomique (France)
CEGB:	Central Electricity Generating Board (UK)
CNEA:	Comision National de la Energia Atomica (Argentina)
COMINAK:	Compagnie des Mines d'Akouta (Republic of Niger)
DOE:	Department of Energy (US)
EEC:	European Economic Community
EIA:	Energy Information Agency (US)
EMR:	Department of Energy Mines & Resources (Canada)
ENEL:	Ente Nationale per l'Energie Elettrica
ENUSA:	Empresa Nacional del Uranio S.A. (Spain)
ERA:	Energy Resources of Australia
ESCOM:	Electricity Supply Commission (South Africa)
EdF:	Electricite de France
FBFC:	Societe Franco-Belge de Fabrications de Combustibles
FBR:	Fast breeder reactor
FRG:	Federal Republic of Germany
GCHWR:	gas-cooled heavy-water moderated reactor
GCR:	gas-cooled reactor
GNP:	Gross National Product
HTGR:	high-temperature gas-cooled reactor
HWLWR:	heavy water moderated boiling light-water-cooled reactor
IAEA:	International Atomic Energy Agency
INFCE:	International Nuclear Fuel Cycle Evaluation
JAURD:	Japan-Australia Uranium Resource Development Co.
JEN:	Junta de Energia Nuclear (Spain)
LGR:	light-water cooled graphite-moderated reactor
LMFBR:	liquid metal fast breeder reactor
LTFC:	Long-term fixed commitment (swu contract)
LWBR:	light-water breeder reactor
LWCHW:	light-water-cooled heavy-water-moderated reactor
MITI:	Ministry of International Trade and Industry (Japan)
MMN:	Metallurgie et Mecanique Nucleaires
MWe:	Megawatts of electricity
NAPOCOR:	National Power Corporation (Philippines)
NNPA:	Nuclear Non-proliferation Act (US)
NPT:	Treaty on Non-Proliferation of Nuclear Weapons
NRC:	Nuclear Regulatory Commission (US)
NSSS:	Nuclear Steam Supply System
NUFCOR:	Nuclear Fuels Corporation of South Africa Ltd.
OURD:	Overseas Uranium Resources Development Cc., Ltd.
PHWR:	pressurized heavy-water-moderated and cooled reactor
PNC:	Power Reactor and Nuclear Fuel Development Corporation (Japan)
PSC:	Public Service Commission
PUC:	Public Utility Commission (US)
PWR:	pressurized water reactor
RAR:	Reasonably assured resources
RTZ:	Rio Tinto-Zinc Corporation Ltd. (UK)
SMDC:	Saskatchewan Mining Development Corporation (Canada)
SOMAIR:	Societe des Mines de l'Air
SSPB:	Swedish State Power Board
SWU:	Separative Work Unit
THTR:	thorium high-temperature reactor
TMI:	Three Mile Island (US)
TVA:	Tennessee Valley Authority (US)
UEGA:	Uranium Enrichment Group of Australia
UK:	United Kingdom
URDC:	Uranium Resources Development Corp. (Japan)
USBLS:	United States Bureau of Labor Statistics
VTAO:	Variable tails option (swu contract)
WOCA:	World outside communist areas
FIFO:	First in, First out
LIFO:	Last in, First out

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